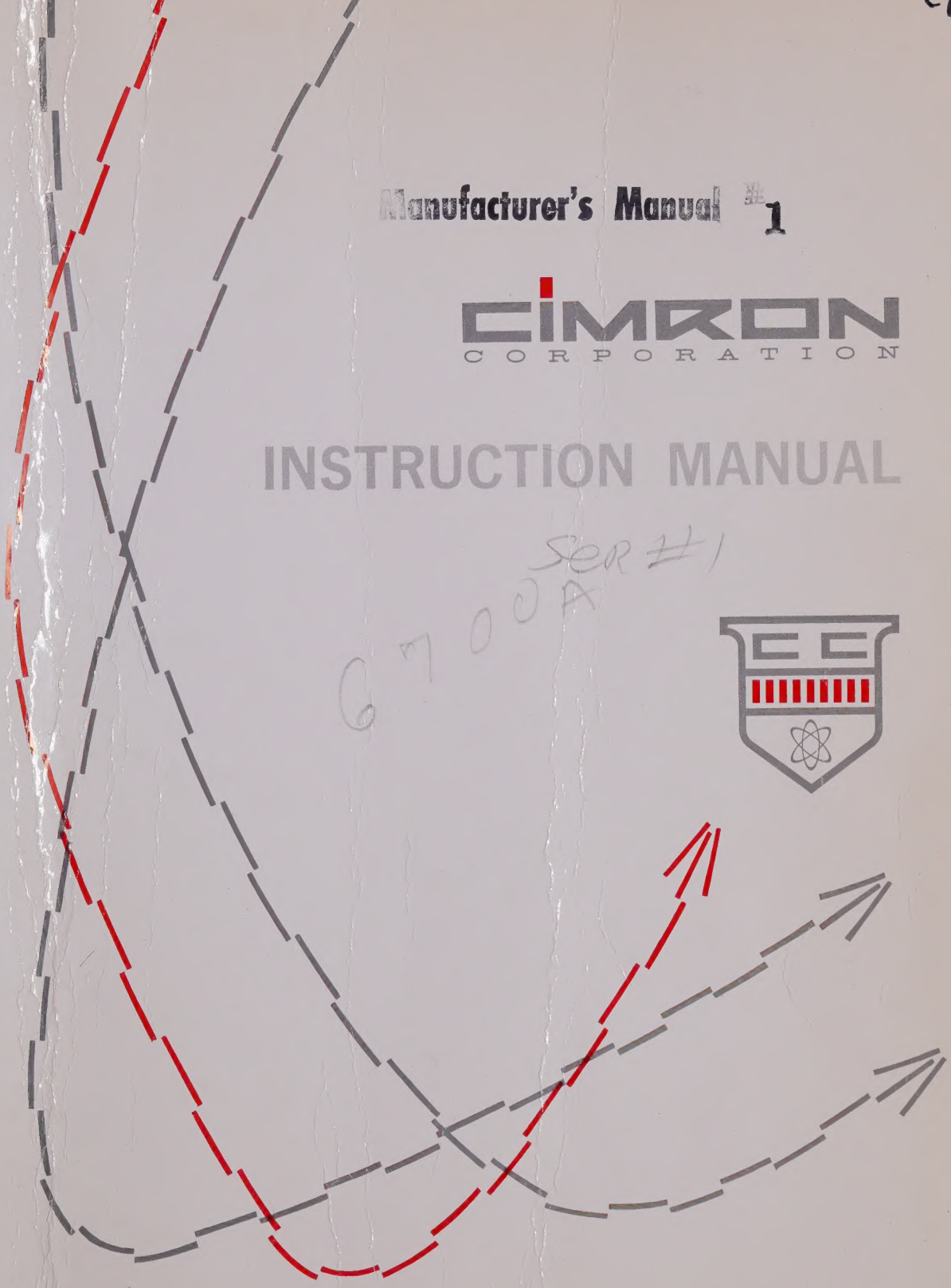
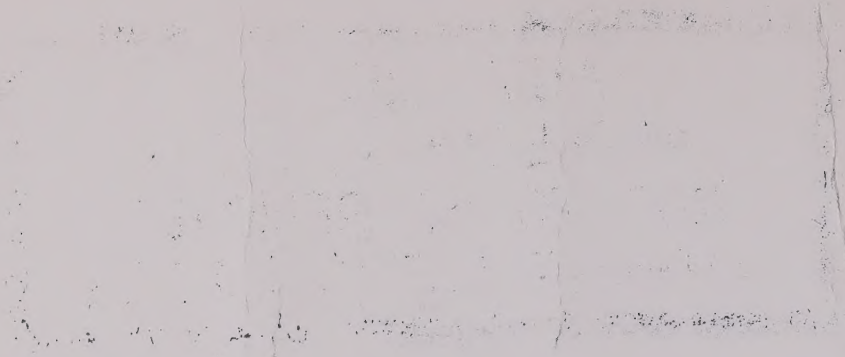
Manufacturer's Manual #1

CIMRON
CORPORATION

# INSTRUCTION MANUAL

6700A SER #1





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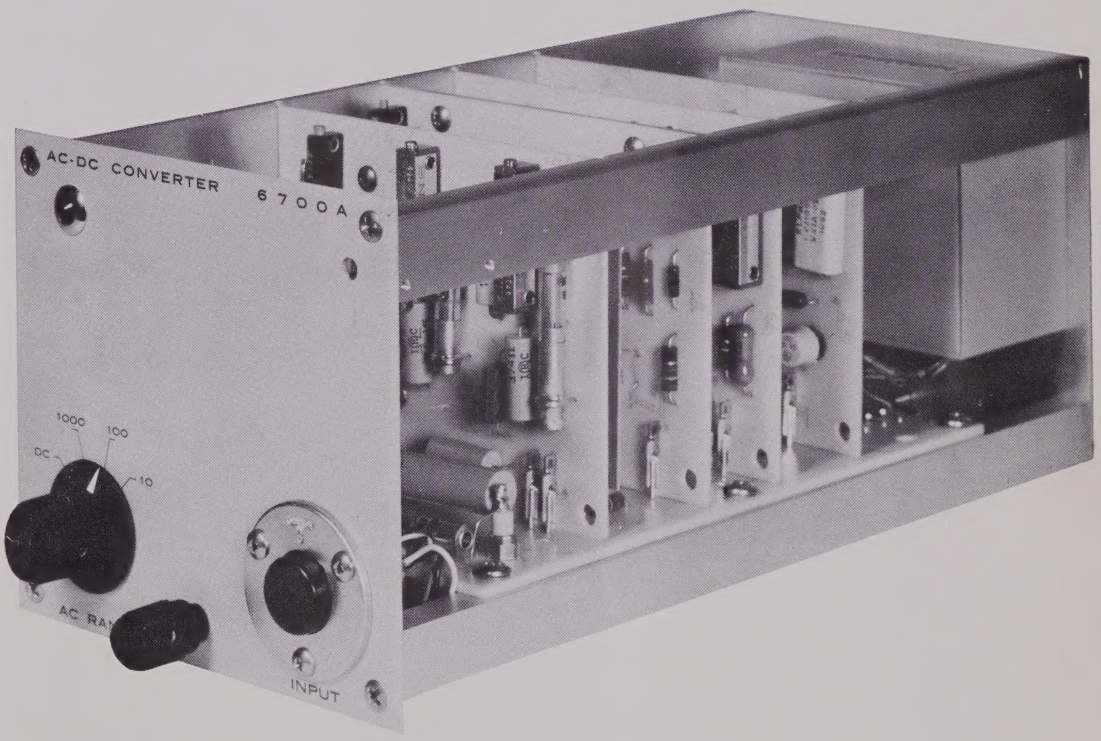


MODEL 6700A AC-DC CONVERTER

CIMRON
CORPORATION

# INSTRUCTION MANUAL

# MODEL 6700A

# AC-DC CONVERTER

CIMRON CORPORATION
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SAN DIEGO 10, CALIFORNIA
Phone 276-3200

# SECTION I

## 1.0 INTRODUCTION

The CIMRON Model 6700A AC-DC Converter is an all solid state, precision, amplifier, rectifier, and filter system. The use of superior diodes incorporated within a high-gain feedback loop give unsurpassed accuracy, linearity, and stability. The amplifier uses all silicon transistors including a field-effect type at the input. The field-effect transistor is markedly superior to normal transistors when operated from high impedance sources. The power supplies are self-contained and regulated, making the performance independent of the particular CIMRON Digital Volt-meter it is used with. Input power is only 4 volt-amps, so that the temperature rise is very low.

## 1.1 SPECIFICATIONS

| | |
|---|---|
| VOLTAGE RANGE | With CIMRON Series 7000 full-five digit volt-meters - 0.0000 to 999.99V AC in three manually-selected ranges of 9.9999, 99.999, and 999.99V AC. With CIMRON Series 6000 four-digit voltmeters - 0.000 to 999.9V AC in three manually-selected ranges of 9.999, 99.99, and 999.9V AC. |
| ACCURACY | Within 0.05% of reading or ±0.01% of full scale from 50 cps to 5Kcps. Within 0.1% of reading or ±0.02% of full scale from 30 cps to 10 Kcps.<br><br>Typically within 0.02% of full scale over the total frequency range of 30 cps to 10 Kcps and over the whole voltage range. Over the frequency range of 20 cps to 20 Kcps accuracy is typically within 0.1% of reading or 0.02% of full scale. |
| STABILITY | Typically better than 0.03% of full scale for at least 90 days under laboratory conditions. |
| RESOLUTION | 0.005% of reading or 1 digit. |
| LINEARITY | Within 0.01% of full scale from 50 cps to 5 Kcps, and within 0.02% of full scale from 30 cps to 10 Kcps. |

| | |
|---|---|
| INPUT IMPEDANCE | 10 megohms shunted by less than 50 pf. |
| FLOATING INPUT | Input to the converter is floating from case ground, power line ground or printer output of the digital voltmeter. |
| CONVERSION METHOD | DC output is the RMS equivalent of the full-wave average value of the input. |
| CALIBRATION | Each range has one adjustment for low frequency calibration and one adjustment for high frequency calibration. After calibration, frequency response is flat within ±0.03% from 30 cps to 10 Kcps. |
| OVER-VOLTAGE PROTECTION | No damage or change in performance will result from the continuous application of 1000V AC or DC to the input. |
| POWER REQUIREMENTS | 115V ±10%, 50-400 cps, 4 volt-amps. Integral power supply. |

## 1.2 OPERATION

The Model 6700A may be used in any Series 6000 or 7000 volt or volt-ratiometer. It is plugged-in in place of the Model 6900 input assembly, or any other plug-in accessory. The cable assembly used is the standard for voltmeters. It features a low capacity (approximately 15pf/ft) input lead. Normally, a few minutes stabilizing time is sufficient. The circuitry is powered continuously regardless of the range switch position, so that AC operation can be obtained with very little delay after switching from DC.

Setting the range switch to DC completely disconnects the input of the converter from the input leads for normal DC operation.

When measuring a floating AC source, the low side of the source should be referenced to the power ground, i.e., the green (chassis) lead. When measuring grounded sources, the low side of the input must be connected to the grounded side of the source; the chassis connection may be omitted.

# SECTION II

## 2.0 GENERAL

The CIMRON Model 6700A AC-DC Converter is characterized by unusually good accuracy, resolution, and stability. Its performance normally is substantially superior to typical AC calibrating sources. For this reason, calibration should only be attempted against a thermal transfer standard. If an apparent instability exists, say ±0.01% to 0.02% of reading, then the AC source is a likely difficulty.

All adjustments necessary for proper operation are straight forward and require a minimum of time. Under normal conditions they never need to be readjusted from their factory settings unless components or assemblies in the converter are replaced.

## 2.1 DC ADJUSTMENTS

Before attempting to adjust or calibrate the converter, be certain that the CIMRON digital volt or volt-ratiometer is working properly and is calibrated. Plug in the converter, and with the covers in place, allow equipment to stabilize for at least 30 minutes. When ready to adjust, remove the top cover of the voltmeter, and switch the 6700A to the 1,000 volt range.

### 2.1.1 Bias:

This control sets proper operating conditions for the field-effect input transistors. This adjustment, labeled BIAS, is located on the #2 (amplifier) assembly. Connect a VTVM or 20,000 ohms/volt VOM between TP-1, located on the #1 (attenuator) assembly and one of the assembly shields. Adjust the BIAS for zero volts at TP-1. If the adjustment should be at one end of the potentiometer, a voltage of ±0.1 is satisfactory.

### 2.1.2 DC Balance:

This control, located on the #3 (output) assembly, sets the operating DC level of the output transistor. Connect the VTVM or VOM between TP-2 (also on #3) and an assembly shield. Adjust the DC BAL to set +27 volts at TP-2.

## 2.2 NOISE CHECK

Short the input leads together and to the green chassis lead. Switch the converter to the 10 volt range. Use a scope to observe the AC signal at TP-2, with the scope common connected to an assembly shield. The combined hum and high frequency noise is typically about 0.5 to 0.8 volts peak to peak. The AC feedback loop is essentially open at these low levels

because the rectifier diodes are not conducting appreciably. Noise peaks which exceed the diode threshold appear clipped due to the sharp drop in net gain as the feedback comes in. Excessive noise is most often due to Q1, the input field-effect transistor. However, Q201, Q202, or Q203 may be at fault.

The effects of excessive noise are increased offset at zero input, and occasionally a noisy output at zero or for small signals.

## 2.3 AC CALIBRATION

### 2.3.1 Equipment Required:

The following equipment is recommended for its broad range of voltages and frequencies. However, any source of high stability, low distortion sine wave output may be used. All voltages should be determined by an accurate thermal transfer standard if the full capabilities of the Model 6700A are to be realized.

A) AC Source: Holt Laboratories AVS-321 or AVS-323A AC Standard with suitable oscillator.

B) Calibration: Holt TV-1 Transfer Voltmeter with an 0.01% DC voltage source.

C) Tool: Non-metalic alignment tool such as a JFD #5284.

Note that assemblies #1 and #2 must have their shields installed or calibration is not possible.

### 2.3.2 DVM Control Settings:

#### 2.3.2.1 6000 Series

A) POWER to ON

B) SENSITIVITY to HI

C) FUNCTION to AC

D) DC RANGE to 10

E) PRINT CONTROL (if any) to TRACK

#### 2.3.2.2 7000 Series

A) POWER to FILTER IN

B) SENSITIVITY to HI

C) PRINT CONTROL (if any) to TRACK

D) FUNCTION to AC

E) DC RANGE to AUTO

2.3.3 Zero Adjustment:

The ZERO control is accessible through the panel. It is used to compensate for the small residual output due to noise and other causes. Adjust it to obtain a zero reading on the DVM with the Model 6700A set to 10 volt range. With the 7000 Series, it is generally possible to maintain "zero" only within a few digits. Best setting of the ZERO control for use in 6000 Series Voltmeters is +1 millivolt to reduce unnecessary running with polarity reversal due to noise. The polarity can be observed by switching the FUNCTION control temporarily back to DC for this test.

The magnitude of offset with shorted input changes slightly with range setting. Normally, this change is too small to merit readjustment, being less than 1 millivolt.

2.3.4 Procedure (see figure 2-1):

2.3.4.1 Low Frequency

A) Switch to the 1,000 volt range. Apply 995 volts input at 100 cps. Adjust the 1,000 volt calibration potentiometer. On the #1 (attenuator) assembly (rightmost as you fact it) for a correct reading.

B) Switch to the 100 volt range. Apply 99.5 volts input at 100 cps. Adjust the 100 volt calibration potentiometer for a correct reading.

C) Switch to the 10 volt range. Apply 9.95 volts input at 100 cps. Adjust the 10 volt calibration potentiometer for a correct reading.

D) There is some interaction between controls. Therefore, it is necessary to follow the order specified above in making adjustments. Repeat above steps until each range is correct.

2.3.4.2 High Frequency

A) Switch to the 1,000 volt range. Apply 995 volts at 10 KC (or as high a voltage as is available, depending upon the source). Adjust C103, the capacitor adjacent to the 1,000 volt calibration potentiometer for a correct reading.

B) Similarly, adjust the 100 volt and 10 volt ranges, repeating the steps in order until all are correct.

C) C2, the high frequency adjustment for the 10 megohm input resistor is used to center the adjustments of all ranges. It almost never needs resetting from the factory adjustments unless there has been physical damage or displacement of the 10 megohm resistor from its original position.

2.3.4.3 Spot Frequency Check

For a properly working instrument, calibration at 100 cps and 10 KC is quite sufficient. However, if desired, a check at 40 cps, 1, 2, 4, 6, and 8 KC may be made to verify performance.

## 2.4 LINEARITY CHECK

As a rule, a converter which will calibrate well will have good linearity, because the amplifier characteristics required for one insures the other.

Use a ratio transformer as a variable source, since very few resistive dividers have a sufficiently low or constant output impedance.

A) Switch to the 10 volt range. Set the ratio transformer to read .9995. Adjust the AC input at the desired frequency until the voltmeter reads exactly 9.995 volts. Then switch to successively lower voltages and compare any deviation from the exact value with the specifications.

B) Linearity on other ranges will be slightly better than on the 10 volt range. Therefore, a check on the other ranges is not necessary.

Note that a few ratio transformers maintain 0.01% or better linearity at 10 KC. If a check is made at 5 KC or higher, the accuracy of the ratio transformer will have to be considered.

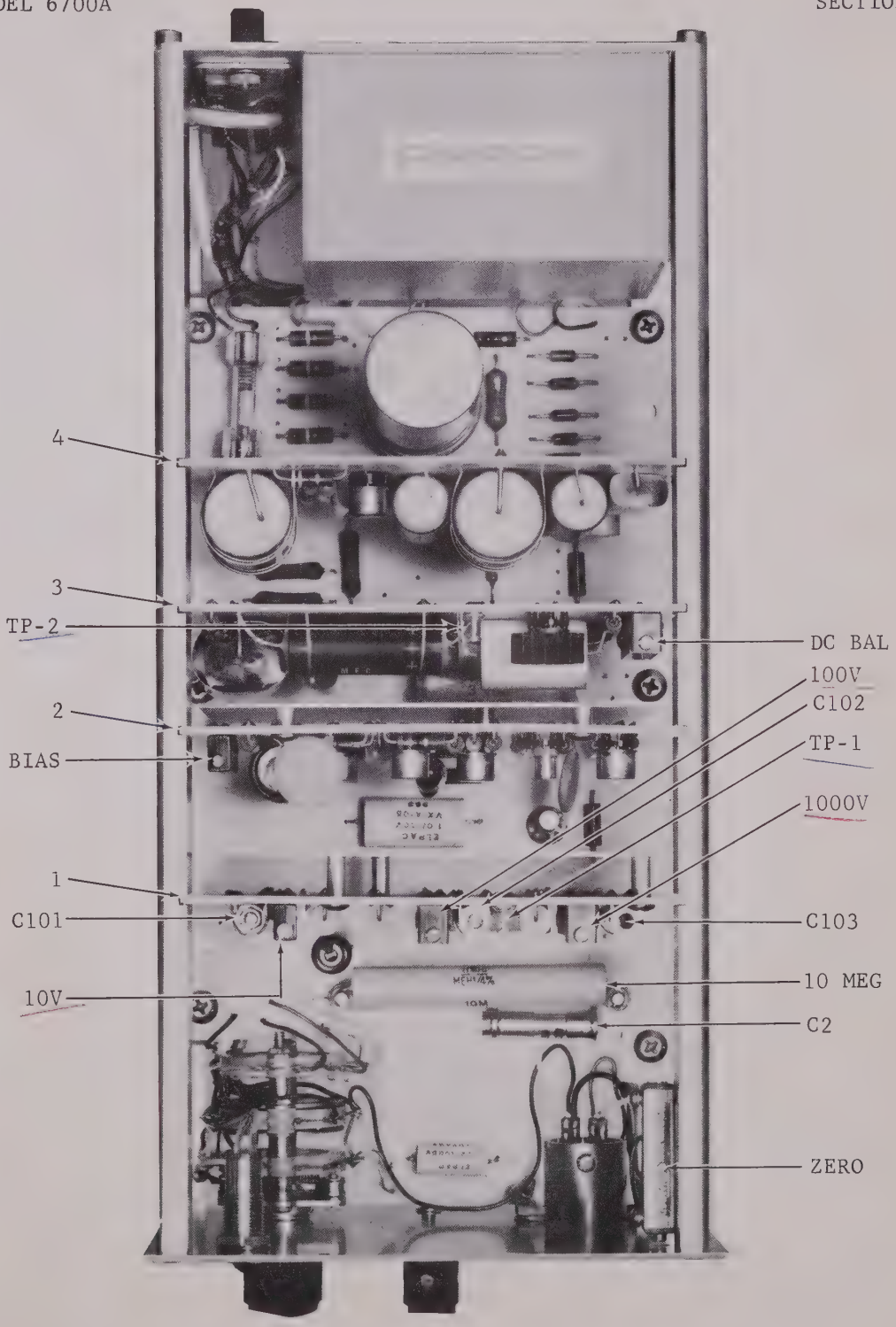
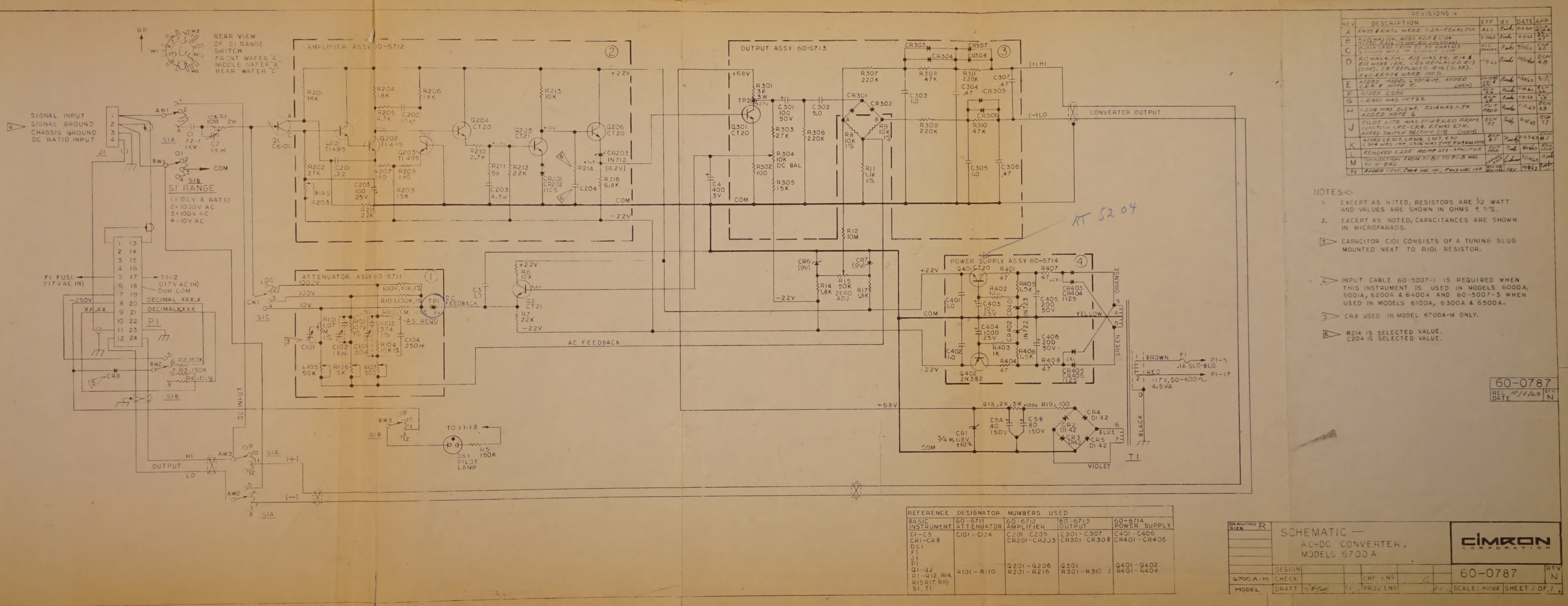



Figure 2-1. Model 6700A AC-DC Converter.




| REVISIONS ◇ | | | | | |
|---|---|---|---|---|---|
| REV | DESCRIPTION | EFF | BY | DATE | APP |
| A | R405 & R406 WERE 1.2K-R5 WAS 5K | ALL | Frank | 3-26-63 | [illegible] |
| B | R20 WAS 10K, ADDED R215 & C104. ADDED 2 PIN JUMPER ACROSS J1 | 3-3062 | Frank | 4-2-63 | ECN 57 |
| C | BLACK LEAD FROM T1 TO CHASSIS WAS #20 | ALL REMARK | Frank | 4-26-63 | ECN 60 |
| D | R13 WAS 4.7M, R15 WAS 5K, R14 & R17 WERE 1.5K, CR8 REPLACED R13 (470K), CR7 REPLACED R16 (3.3K). R40 & R404 WERE 100 Ω. | 3-42 | Frank | 10-1-63 | ECN 48 |
| E | ADDED, MODEL 6700A-M, ADDED CR8 ◇ NOTE 5. | 3-1170 3-1287 | Frank | 10-23-63 | ECN [illegible] |
| F | ADDED C205 | 3-1287 | Frank | 11-14-63 | ECN 64 |
| G | CR401 WAS IN722. | 3-1287 | Frank | 1-13-63 | ECN 68 |
| H | C204 WAS 2.2mF. R214 WAS 11.5K ADDED NOTE 6 | 3-1287 | Frank | 1-29-63 | ECN 69 |
| J | PILOT LITE WAS ATTACHED FROM JUNCTION C82-CR4. R5 WAS 27M. ADDED SWITCH SECTION S1B (1-1287) | ECN 77 | Frank | 2-25-63 | ECN 77 |
| K | ADDED CR307, CR308, C307, R311, C304 WAS 1MF, C306 WAS 2MF, R307 WAS 220Ω | ECN 81 | Frank | 2-23-63 | ECN 81 |
| L | REMOVED C205 .1UF MF 25V CAPACITOR | ECN 87 | Frank | 3-26-63 | ECN 100 |
| M | CONNECTION FROM S1-B11 TO P1-8 WAS TO J1 BWZ | ECN 90 | Frank | 8/14/63 | Frank |
| N | ADDED C205, C206 WAS 100, R403 WAS 100 | ECN 98 | Frank | 10-8-63 | Frank |

NOTES ◇

1. EXCEPT AS NOTED, RESISTORS ARE ½ WATT AND VALUES ARE SHOWN IN OHMS ± 5%.
2. EXCEPT AS NOTED, CAPACITANCES ARE SHOWN IN MICROFARADS.

3 ▷ CAPACITOR C101 CONSISTS OF A TUNING SLUG MOUNTED NEXT TO R101 RESISTOR.

4 ▷ INPUT CABLE 60-5007-1 IS REQUIRED WHEN THIS INSTRUMENT IS USED IN MODELS 6000A, 5001A, 6200A & 6400A AND 60-5007-3 WHEN USED IN MODELS 6100A, 6300A & 6500A.

5 ▷ CR8 USED IN MODEL 6700A-M ONLY.

6 ▷ R214 IS SELECTED VALUE. C204 IS SELECTED VALUE.

60-0787
REL 10/15/63
REV N

| REFERENCE DESIGNATOR NUMBERS USED | | | | |
|---|---|---|---|---|
| BASIC INSTRUMENT | 60-6711 ATTENUATOR | 60-6712 AMPLIFIER | 60-6713 OUTPUT | 60-6714 POWER SUPPLY |
| C1-C5<br>CR1-CR8<br>DS1<br>F1<br>J1<br>P1<br>Q1-Q2<br>R1-R12, R14, R15 R17 R19<br>S1, T1 | C101 - C104<br><br><br><br><br><br>R101 - R110 | C201 C205<br>CR201-CR203<br><br><br><br>Q201 - Q206<br>R201 - R216 | C301 - C307<br>CR301-CR308<br><br><br><br>Q301<br>R301 - R310 | C401 - C406<br>CR401 - CR405<br><br><br><br><br>Q401 - Q402<br>R401 - R408 |

DRAWING SIZE R

SCHEMATIC —
AC-DC CONVERTER,
MODELS 6700A

CIMRON CORPORATION

| | DESIGN | | | | 60-0787 | REV N |
|---|---|---|---|---|---|---|
| 6700A-M | CHECK | | CHF ENG | | | |
| MODEL | DRAFT | | PROJ ENG | | SCALE: NONE | SHEET 1 OF 1 |

| 60-0787 | |
|---|---|
| REL DATE 10/23/62 | REV E |

# SCHEMATIC —
## AC-DC CONVERTER,
## MODELS 6700 A & 6700A-M

CIMRON CORPORATION

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| DESIGN | | | | | | 60-0787 | REV E |
| CHECK | | | CHF ENG | | | | |
| DRAFT | R M Fiato | 2/20/62 | PROJ ENG | L. Cooper | 2-20-62 | SCALE: NONE | SHEET 1 OF 1 |

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